

# PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2002-299829  
 (43)Date of publication of application : 11.10.2002

(51)Int.Cl.

H05K 3/46  
 H01F 27/00  
 H01F 17/00  
 H01G 4/40  
 H01L 25/00  
 H05K 3/32  
 // H03H 9/25

(21)Application number : 2001-102711

(71)Applicant : KYOCERA CORP

(22)Date of filing : 30.03.2001

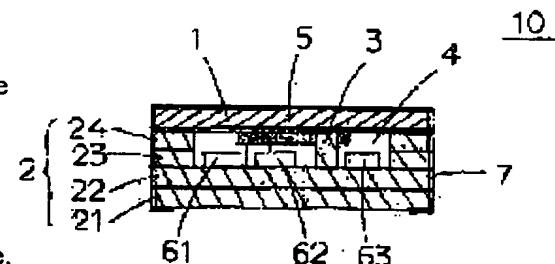
(72)Inventor : HIROTA MUTSUAKI

## (54) COMPOSITE ELECTRONIC COMPONENT

(57)Abstract:

**PROBLEM TO BE SOLVED:** To provide a composite electronic component that can be reduced in size and can be assembled easily.

**SOLUTION:** The composite electronic component is provided with a multilayered substrate 2 in which an LC filter composed of a transmission line and a capacitor is arranged. Recessed sections 4 are formed on the upper surface of the substrate 2, and external electrodes 7 are provided from the lower surface to the side faces of the substrate 2. An IC, the capacitor, etc., are positioned in the recessed sections 4. In addition, a wiring pattern 90 is formed on a substrate 1, and a surface acoustic wave filter 5 is mounted on the pattern 90 in a bare chip state. The recessed sections 4 are sealed by sticking the substrate 1 to the substrate 2 with an anisotropic conductive adhesive by bringing connecting electrodes 8 provided on the upper surface of the substrate 2 into contact with the electrode pads 9 of the substrate 1.



(19)日本国特許庁 (JP)

(12) 公開特許公報 (A)

(11)特許出願公開番号

特開2002-299829

(P2002-299829A)

(43)公開日 平成14年10月11日 (2002.10.11)

(51)Int.Cl.<sup>7</sup>

H 05 K 3/46  
H 01 F 27/00  
17/00  
H 01 G 4/40  
H 01 L 25/00

識別記号

F I

H 05 K 3/46  
H 01 F 17/00  
H 01 L 25/00  
H 05 K 3/32  
H 03 H 9/25

テ-マ-ト<sup>8</sup>(参考)

Q 5 E 0 7 0  
D 5 E 0 8 2  
B 5 E 3 1 9  
B 5 E 3 4 6  
A 5 J 0 9 7

審査請求 未請求 請求項の数 2 O L (全 5 頁) 最終頁に統く

(21)出願番号

特願2001-102711(P2001-102711)

(22)出願日

平成13年3月30日 (2001.3.30)

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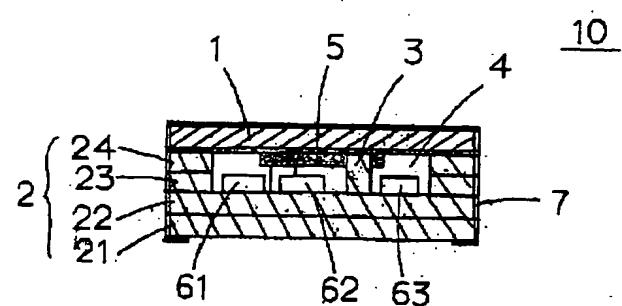
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(54)【発明の名称】 複合電子部品

(57)【要約】

【課題】小型化が可能で、組み立ての容易な複合電子部品を提供する。

【解決手段】複合電子部品10は、内部に伝送線路及びコンデンサからなるLCフィルタが配置された多層基板2を備え、多層基板2の上面には凹部4が設けられ、多層基板2の下面から側面に架けて外部電極7が設けられる。そして、多層基板2の凹部4内に、ICやコンデンサが搭載され、基板1には配線パターン90が形成されその上にペアチップ状態で、弾性表面波フィルタ5が搭載され、多層基板2の上面に設けられた接続電極8と基板1の電極パッド9とを当接させて異方性導電性接着剤で接続封止する。



## 【特許請求の範囲】

【請求項1】複数の誘電体層が積層されるとともに上面に少なくとも1つの凹部を有した多層基板と、該多層基板の上面で凹部周囲に形成された複数の接続電極と、前記誘電体層間に形成された分布定数線路からなるフィルタと、前記凹部の底面に搭載された電子部品素子と、前記多層基板の側面又は下面の平坦部の少なくとも一方に形成された外部端子とからなる第1の電子部品と、誘電体基板と、該誘電体基板の下面に形成された電極配線パターンと、該電極配線パターン上に搭載され、電極が前記電極配線パターンに接続される弹性表面波素子と、前記電極配線パターンに接続し、前記多層基板上面の接続電極と対向する複数の電極パッドとからなる第2の電子部品とから成り、前記多層基板上面の接続電極と、前記誘電体基板下面の電極パッドとを異方性導電接着剤を介して接合したことを特徴とする複合電子部品。

【請求項2】前記多層基板は、凹部壁面に凹部内に伸びる延出壁部を有しており、該延出壁部の上面に接続電極が形成されていることを特徴とする請求項1に記載の複合電子部品。

## 【発明の詳細な説明】

## 【0001】

【発明の属する技術分野】本発明は、移動体通信機などに使用される複合電子部品に関し、特に、内部に受動素子からなるフィルタが配置された多層基板の上面に設けた凹部内に、弹性表面波素子が搭載される複合電子部品に関する。

## 【0002】

【従来の技術】図4は、従来の複合電子部品の一般的な断面図を示すもので、複合電子部品100は、内部にLCフィルタを配置した多層基板102を備える。多層基板102の下面には、凹部142が設けられ、その凹部142内にペアチップ状態の弹性表面波フィルタ105が搭載されるとともに、多層基板102の上面の平坦部にIC及びコンデンサなどの電子部品161～163が搭載される。また、凹部142は、金属製の平板状キャップ192により封止される。

## 【0003】

【発明が解決しようとする課題】ところが、上記の従来の複合電子部品においては、多層基板の下面に、弹性表面波フィルタを搭載する凹部と、上面にICやコンデンサなどを搭載する平坦部を設け、これらICやコンデンサなどの集中定数回路部品の全体を覆う形で金属製のシールドカバーを取り付ける必要がある。すなわち、複数の部品が多層基板の上面、下面に配置されるため、これらを外乱ノイズから、守るために金属製平板状キャップや金属製シールドケースを取り付ける必要があり、部品点数が増えるとともに、組立工数がかかりコストアップの大きな要因になるという問題点があった。

【0004】本発明は、このような問題点を解決するためになされたものであり、小型化が可能で安価な複合電子部品を提供することを目的とする。

## 【0005】

【課題を解決するための手段】上述する問題点を解決するため本発明は、複数の誘電体層が積層されるとともに上面に少なくとも1つの凹部を有した多層基板と、該多層基板の上面で凹部周囲に形成された複数の接続電極と、前記誘電体層間に形成された分布定数線路からなるフィルタと、前記凹部の底面に搭載された電子部品素子と、前記多層基板の側面又は下面の平坦部の少なくとも一方に形成された外部端子とからなる第1の電子部品と、誘電体基板と、該誘電体基板の下面に形成された電極配線パターンと、該電極配線パターン上に搭載され、電極が前記電極配線パターンに接続される弹性表面波素子と、前記電極配線パターンに接続し、前記多層基板上面の接続電極と対向する複数の電極パッドとからなる第2の電子部品とから成り、前記多層基板上面の接続電極と、前記誘電体基板下面の電極パッドとを異方性導電接着剤を介して接合したことを特徴とする複合電子部品である。

【0006】また、前記多層基板は、凹部壁面に凹部内に伸びる延出壁部を有しており、該延出壁部の上面に接続電極が形成されていることを特徴とする。本発明の複合電子部品によれば、分布定数線路からなるフィルタを内蔵した多層基板と、その上面凹部に電子部品を搭載し、別の誘電体基板に搭載した弹性表面波フィルタをその基板下面に設けた電極パッドと多層基板の上面に接続電極を配置して接合させ、間を異方性導電接着剤で接続

30 封止するため、多層基板凹部の内部表面と基板下面を部品搭載に利用することができ、複合電子部品の小型化を達成することができる。また多層基板と基板を別々に組み立てることができ、部品の不具合による不良を最小限に止めることができる。また従来あったシールドケースや金属性キャップを取り付ける必要が無く、部品点数の削減と組み立て工数の削減を図ることができる。

## 【0007】

【発明の実施の形態】図1に、本発明の複合電子部品に係る実施例の断面図を示す。複合電子部品10は、内部に伝送線路及びコンデンサからなるLCフィルタ(図示せず)が配置された多層基板2を備え、多層基板2の上面には凹部4が設けられ、多層基板2の下面から側面にかけて外部電極7が設けられ第1の電子部品が構成されている。このような多層基板2は、例えば、次のような方法で製造される。

【0008】低温焼結ガラスセラミック材料からなるグリーンシートを積層した誘電体層21～24を用意する。次いで、誘電体層21～24上に、必要な配線パターン、伝送線路を形成するストリップ電極、コンデンサを形成するコンデンサ電極、及びグランド電極(図示せ

ず)を銀ペーストを用いてスクリーン印刷する。次いで、誘電体層23～24に、パンチングにより、凹部40となるべき穴を設けるとともに、必要なビアホール電極(図示せず)を形成するための穴を設ける。ビアホール電極を形成するための穴には、銀ペーストが充填される。このようにして得られた誘電体層21～24を積み重ね、プレスする。次いで、これを、950℃で1時間焼成する。次いで、その下面から側面に架けての所定の箇所に銀白金ペーストを塗布して焼付けることにより外部電極7を形成する。

【0009】図2に多層基板2の上面図を示す。周囲を囲む多層基板の内側に凹部4が形成されている。この内底面にはICやコンデンサなどの電子部品61～65が搭載されている。周囲を囲む多層基板一部が、一点鎖線で示す弾性表面波素子の配置位置に向かって壁面から張り出し部が設けられて導通手段3を形成する。この張り出し部の上面には接続電極31、32が設けられている。

【0010】図3に誘電体基板1の下面図を示す。その基板1の下面には所定電極パターン90を形成し、その上にペアチップ状態で、弾性表面波素子である弾性表面波フィルタ(以下、SAWフィルタ)5を配置し、フリップチップボンディングにより固定するとともに電気的接続を達成する(第2の電子部品)。誘電体基板の上面にはシールド効果を得るために全面がメタライズされて側面を通してアース電極Gに接続されている。

【0011】基板1の下面の電極パッド9は多層基板2の上面に形成された接続電極8は対向し、それらは異方性導電接着剤により電気的な接続と、封止を同時に達成される。多層基板2の接続電極8、31、32はビアホールを経由して多層基板内部に設けられたストリップラインからなる受動素子フィルタに繋がるとともに、多層基板凹部に搭載された電子部品61～65に接続され、さらに外部電極7に接続されて複合電子部品10が完成する。

【0012】本発明でとくに特徴的なことは基板側の部品(弾性表面波フィルタ5)のすぐそばで当接する導通手段3が、多層基板2の凹部4内で、内壁から張り出す形で形成されており、その上面に設けられた接続電極31、32が基板1の電極パッド(図示せず)に当接して、電気的接続を達成することである。これにより弾性表面波フィルタの直近から多層基板2の回路に接続を取ることができ、配線経路の引き回しによる電気的ロスや部品間の相互干渉を防止することができるところにある。

【0013】この後、個々の複合電子部品10ごとに、多層基板2の側面に設けられた外部電極7を介して、複合電子部品の特性が評価され、その良・不良が判別される。上述した複合電子部品によれば、IC及びコンデンサをLCフィルタを内蔵した多層基板の上面の凹部内に搭載するとともに、その上に配置される基板1の底面に

SAWフィルタを搭載して異方性導電性接着剤で接続封止しているため、従来必要になった金属性のキャップやシールドケースが不要になる。とくに基板1の下面と多層基板2の内面に各種の電子部品やフィルタ素子を搭載するのに十分な面積を確保することができる。これにより小型のフィルタを内蔵した多層基板を利用することができる。したがって、複合電子部品の小型化が可能となる。

【0014】基板1の下面には弾性表面波素子5の搭載だけを示したが、デカッピングコンデンサなどの電子部品を搭載してもよい。なお、上述の実施例においては、多層基板の上面あるいは上面に形成した凹部に能動素子及び受動素子の両方が搭載される場合について説明したが、電子部品である能動素子のみ、あるいは受動素子のみが搭載されても同様の効果が得られる。

【0015】また、多層基板の上面あるいは上面の凹部に搭載される能動素子及び受動素子がチップ部品である場合について説明したが、ペアチップ状態で搭載しても同様の効果が得られる。この場合には、ペアチップ状態の能動素子及び受動素子を樹脂で覆うことにより、信頼性を向上させることができる。さらに、多層基板に内蔵される分布定数線路からなるフィルタとして、伝送線路とコンデンサとで構成されるLCフィルタを示したが、伝送線路のみで構成されるLCフィルタ、内蔵抵抗とコンデンサとで構成されるRCフィルタなどでも同様の効果が得られる。

【0016】

【発明の効果】本発明の複合電子部品によれば、能動素子及び受動素子のいずれか一方を受動素子からなるフィルタを内蔵した多層基板の上面凹部に搭載し、その上に配置される基板の下面に弾性表面波フィルタを設けるため、多層基板の上の回路チェックと、基板へ搭載した弾性表面波フィルタの特性チェックを別々に行うことができる。組み立て、調整の各段階で発生する不良品を排除することができるため、最終工程で高価なICや弾性表面波フィルタ素子の集合体である複合電子部品を廃棄するという事態を回避することができる。

【0017】また、凹部つきの多層基板と、平板状の基板で挟まれる空洞に電子部品や弾性表面波フィルタを内蔵させるため、小型化を達成することができる。さらにシールドケースや金属製平板状キャップを必要とせず、部品点数を減らすとともにこれらを組み立てる工数を減らすことができ、安価な複合部品を提供することができる。

【図面の簡単な説明】

【図1】本発明の複合電子部品に係わる実施例の断面図である。

【図2】本発明の複合電子部品に係る多層基板の上面図である。

【図3】本発明の複合電子部品に係る基板の下面図であ

る。

【図4】従来の複合電子部品を示す断面図である。

【符号の説明】

100、1000 複合電子部品  
1 基板  
2 多層基板  
3 導通手段  
31, 32 接続電極

\* 4

5

61~65

7

8

9

90

\*

凹部(空洞)

弾性表面波フィルタ

電子部品(I C、コンデンサなど)

外部電極

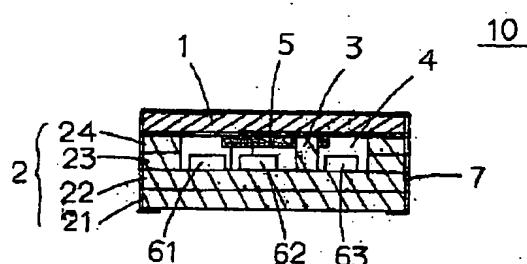
接続電極

電極パッド

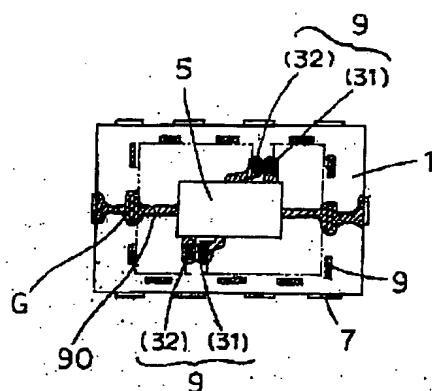
配線パターン

5

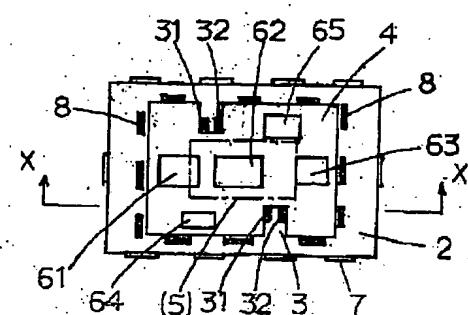
【図1】



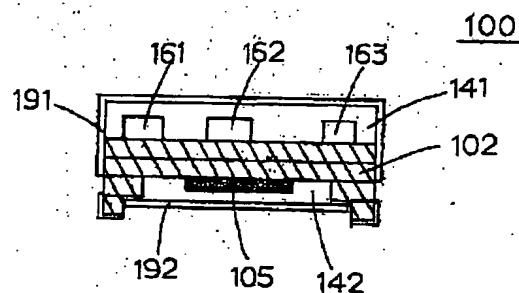
【図3】



【図2】



【図4】



フロントページの続き

(51) Int. Cl. 7  
H 05 K 3/32  
// H 03 H 9/25

識別記号

F I  
H 01 F 15/00  
H 01 G 4/40

マーク(参考)

D  
321 A

F ターム(参考) 5E070 AA05 CB01 CB13  
5E082 AB03 DD08 DD15 EE04 EE24  
FF05 FG04 FG46  
5E319 AA10 AB05 AC01 BB16 GG15  
5E346 AA02 CC18 CC39 DD02 DD13  
DD34 DD45 EE21 FF18 GG06  
GG08 GG09 HH33  
5J097 AA30 AA33 JJ01 KK10 LL08

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**CLAIMS****[Claim(s)]**

[Claim 1] The 1st electronic parts characterized by comprising the following, and a dielectric substrate, An electrode wiring pattern formed in the undersurface of this dielectric substrate, and a surface acoustic element by which it is carried on this electrode wiring pattern, and an electrode is connected to said electrode wiring pattern, A composite electronic component having connected with said electrode wiring pattern, having comprised the 2nd electronic parts that consist of a bonding electrode on said upper surface of a multilayer substrate, and two or more electrode pads which counter, and joining a bonding electrode on said upper surface of a multilayer substrate, and an electrode pad under [ said ] a dielectric substrate via anisotropic conductive adhesive. A multilayer substrate with at least one crevice to the upper surface while two or more dielectric layers are laminated.

Two or more bonding electrodes formed in the circumference of a crevice on the upper surface of this multilayer substrate.

A filter which consists of a distributed constant line formed between said dielectric layers. An electronic parts element carried in the bottom of said crevice, and an external terminal formed at least in one side of a flat part of the side of said multilayer substrate, or the undersurface.

[Claim 2] The composite electronic component according to claim 1, wherein said multilayer substrate has an extension wall part extended in a crevice on a crevice wall surface and a bonding electrode is formed in the upper surface of this extension wall part.

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**DETAILED DESCRIPTION**

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**[Detailed Description of the Invention]****[0001]**

**[Field of the Invention]** This invention relates to the composite electronic component by which a surface acoustic element is carried in the crevice established in the upper surface of the multilayer substrate by which the filter which becomes an inside from a passive component especially has been arranged about the composite electronic component used for a mobile transmitter etc.

**[0002]**

**[Description of the Prior Art]** Drawing 4 shows the common sectional view of the conventional composite electronic component, and the composite electronic component 100 is provided with the multilayer substrate 102 which has arranged the LC filter inside. While the crevice 142 is established in the undersurface of the multilayer substrate 102 and the surface acoustic wave filter 105 of a bare chip state is carried in the crevice 142, the electronic parts 161-163, such as IC and a capacitor, are carried in the flat part of the upper surface of the multilayer substrate 102. The crevice 142 is closed by the metal plate-like cap 192.

**[0003]**

**[Problem(s) to be Solved by the Invention]** However, in the above-mentioned conventional composite electronic component, It is necessary to provide the crevice in which a surface acoustic wave filter is carried, and the flat part which carries IC, a capacitor, etc. in the upper surface in the undersurface of a multilayer substrate, and to attach metal shield covers to it for the whole lumped-constant-circuit part, such as these ICs and a capacitor, with a wrap form. Namely, while it is necessary to attach a metal-plates-like cap and metal shielding cases and part mark increase in order to protect these from a disturbance noise since two or more parts are arranged on the upper surface of a multilayer substrate, and the undersurface, The number of assemblers was applied and there was a problem of becoming a major factor of a cost hike.

**[0004]** This invention is made in order to solve such a problem, and it is a thing.

The purpose is to come out and to provide a cheap composite electronic component.

[0005]

[Means for Solving the Problem] The 1st electronic parts this invention is characterized by that comprise the following in order to solve a problem mentioned above, A dielectric substrate and an electrode wiring pattern formed in the undersurface of this dielectric substrate, A surface acoustic element by which it is carried on this electrode wiring pattern, and an electrode is connected to said electrode wiring pattern, A composite electronic component which connects with said electrode wiring pattern, comprises the 2nd electronic parts that consist of a bonding electrode on said upper surface of a multilayer substrate, and two or more electrode pads which counter, joins a bonding electrode on said upper surface of a multilayer substrate, and an electrode pad under [ said ] a dielectric substrate via anisotropic conductive adhesive, and is characterized by things.

A multilayer substrate with at least one crevice to the upper surface while two or more dielectric layers are laminated.

Two or more bonding electrodes formed in the circumference of a crevice on the upper surface of this multilayer substrate.

A filter which consists of a distributed constant line formed between said dielectric layers. An electronic parts element carried in the bottom of said crevice, and an external terminal formed at least in one side of a flat part of the side of said multilayer substrate, or the undersurface.

[0006] Said multilayer substrate has an extension wall part extended in a crevice on a crevice wall surface, and a bonding electrode is formed in the upper surface of this extension wall part. A multilayer substrate which built in a filter which consists of distributed constant lines according to the composite electronic component of this invention, In order to make a bonding electrode arrange and contact the upper surface of an electrode pad which provided a surface acoustic wave filter which carried electronic parts in the upper surface recess, and was carried in another dielectric substrate in the substrate undersurface, and a multilayer substrate and to carry out connection closure of the between by anisotropic conductive adhesive, The inner surface and the substrate undersurface of a multilayer substrate crevice can be used for an element placement, and a miniaturization of a composite electronic component can be attained. A multilayer substrate and a substrate can be assembled independently and a defect by fault of parts can be stopped to the minimum. There is no necessity of attaching a shielding case and a metallic cap which existed conventionally, it can assemble with reduction of part mark, and reduction of a man day can be aimed at.

[0007]

[Embodiment of the Invention] The sectional view of the example concerning the composite electronic component of this invention is shown in drawing 1. The composite electronic

component 10 is provided with the multilayer substrate 2 by which the LC filter (not shown) which becomes an inside from the transmission line and a capacitor has been arranged, the crevice 4 is established in the upper surface of the multilayer substrate 2, the exterior electrodes 7 are formed from the undersurface of the multilayer substrate 2 to the side, and the 1st electronic parts are constituted. Such a multilayer substrate 2 is manufactured by the following methods, for example.

[0008]The dielectric layers 21-24 which laminated the green sheet which consists of a low-temperature-sintering glass ceramic material are prepared. Subsequently, the strip electrode which forms a required circuit pattern and the transmission line on the dielectric layer 21-24, the capacitor electrode which forms a capacitor, and a ground electrode (not shown) are screen-stenciled using silver paste. Subsequently, while establishing the hole which should serve as the crevice 40 by punching in the dielectric layers 23-24, the hole for forming a required beer hall electrode (not shown) is provided. The hole for forming a beer hall electrode is filled up with silver paste. Thus, the obtained dielectric layers 21-24 are accumulated and pressed. Subsequently, this is calcinated at 950 \*\* for 1 hour. Subsequently, the exterior electrodes 7 are formed by applying and baking a silvery whiteness gold paste on the predetermined part constructed in the side from the undersurface.

[0009]The plan of the multilayer substrate 2 is shown in drawing 2. The crevice 4 is formed inside the multilayer substrate surrounding the circumference. The electronic parts 61-65, such as IC and a capacitor, are carried in this inner bottom. An overhang section is provided from a wall surface toward the locating position of the surface acoustic element which the multilayer substrate surrounding the circumference part shows with a dashed dotted line, and the conduction means 3 is formed. The bonding electrodes 31 and 32 are formed in the upper surface of this overhang section.

[0010]The bottom view of the dielectric substrate 1 is shown in drawing 3. The predetermined electrode pattern 90 is formed in the undersurface of the substrate 1, and an electrical link is attained, while arranging the surface acoustic wave filter (the following, SAW filter) 5 which is a surface acoustic element in the state of a bare chip and fixing by flip chip bonding on it (the 2nd electronic parts). In order to acquire a shielding effect on the upper surface of a dielectric substrate, metallizing of the whole surface is carried out and it is connected to ground electrode G through the side.

[0011]The bonding electrode 8 in which the electrode pad 9 of the undersurface of the substrate 1 was formed in the upper surface of the multilayer substrate 2 counters, and they are simultaneously attained by anisotropic conductive adhesive in electric connection and closure. It is connected to the electronic parts 61-65 carried in the multilayer substrate crevice, it is further connected to the exterior electrodes 7, and the composite electronic component 10 completes the bonding electrodes 8, 31, and 32 of the multilayer substrate 2 while they are connected with the passive component filter which consists of a stripline provided in the inside of a multilayer substrate via the beer hall.

[0012]The conduction means 3 which contacts immediately near the parts (surface acoustic wave filter 5) by the side of a substrate a characteristic thing especially by this invention in the crevice 4 of the multilayer substrate 2, It is being formed in the form jutted out of a wall, and the bonding electrodes 31 and 32 provided in the upper surface contacting the electrode pad (not shown) of the substrate 1, and attaining an electrical link. Connection can be taken in the circuit of the multilayer substrate 2 from the latest of a surface acoustic wave filter by this, and it is in the ability to prevent the electric loss by leading about of a wiring route, and the mutual interference between parts.

[0013]Then, via the exterior electrodes 7 provided in the side of the multilayer substrate 2, the characteristic of a composite electronic component is evaluated and its good and defect are distinguished each composite electronic component 10 of every. While carrying IC and a capacitor in the crevice of the upper surface of the multilayer substrate which built in the LC filter according to the composite electronic component mentioned above, Since an SAW filter is carried in the bottom of the substrate 1 arranged on it and connection closure is carried out with anisotropy electroconductive glue, conventionally needed a metallic cap and a shielding case become unnecessary. Sufficient area to carry various kinds of electronic parts and filter elements in the undersurface of the substrate 1 and the inner surface of the multilayer substrate 2 especially is securable. The multilayer substrate which built in the small filter by this can be used. Therefore, the miniaturization of a composite electronic component is attained.

[0014]Although only loading of the surface acoustic element 5 was shown in the undersurface of the substrate 1, electronic parts, such as a decoupling capacitor, may be carried. In an above-mentioned example, although the case where both an active device and a passive component were carried in the crevice formed in the upper surface or the upper surface of a multilayer substrate was explained, even if only the active device which is electronic parts, or a passive component is carried, the same effect is acquired.

[0015]Although the case where the active device and passive component which are carried in the crevice of the upper surface of a multilayer substrate or the upper surface were a chip was explained, the same effect is acquired even if carried in the state of a bare chip. In this case, it becomes possible by covering the active device and passive component of a bare chip state by resin to raise reliability. Although the LC filter which comprises the transmission line and a capacitor was shown as a filter which consists of a distributed constant line built in a multilayer substrate, the effect that the LC filter which comprises only the transmission line and the RC filter which comprises built-in resistance and a capacitor are also the same is acquired.

[0016]

[Effect of the Invention]In order to provide a surface acoustic wave filter in the undersurface of the substrate which carries in the upper surface recess of the multilayer substrate which built in the filter which consists of passive components in either one of an active device and a passive component, and is arranged on it according to the composite electronic

component of this invention. The circuitry check on a multilayer substrate and the characteristic check of the surface acoustic wave filter carried to the substrate can be performed independently. Since the inferior goods by which it is generated in each stage of an assembly and adjustment can be eliminated, the situation of discarding the composite electronic component which is an aggregate of expensive IC or a surface acoustic wave filter element by a final process is avoidable.

[0017] Since electronic parts and a surface acoustic wave filter are made to build in the case pinched with a multilayer substrate with a crevice, and a plate-like substrate, a miniaturization can be attained. Furthermore neither a shielding case nor a metal-plates-like cap can be needed, but while reducing part mark, the man day which assembles these can be reduced, and a cheap component module can be provided.

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[Translation done.]

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**DESCRIPTION OF DRAWINGS**

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**[Brief Description of the Drawings]**

[Drawing 1] It is a sectional view of the example concerning the composite electronic component of this invention.

[Drawing 2] It is a plan of the multilayer substrate concerning the composite electronic component of this invention.

[Drawing 3] It is a bottom view of the substrate concerning the composite electronic component of this invention.

[Drawing 4] It is a sectional view showing the conventional composite electronic component.

**[Description of Notations]**

10 and 100 Composite electronic component

1 Substrate

2 Multilayer substrate

3 Conduction means

31 and 32 Bonding electrode

4 Crevice (cave)

5 Surface acoustic wave filter

61-65 Electronic parts (IC, a capacitor, etc.)

7 Exterior electrodes

8 Bonding electrode

9 Electrode pad

90 Circuit pattern

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[Translation done.]